

# Curriculum Vitae — Philip John Rasch

Chief Scientist & Laboratory Fellow  
Atmospheric Sciences and Global Change Division  
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## Education

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B.A. Chemistry	1976	University of Washington
B.S. Atmospheric Science	1976	University of Washington
M.S. Meteorology	1979	Florida State University
Ph.D. Meteorology	1984	Florida State University

## Professional Positions

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2008–present	Chief Scientist & Laboratory Fellow	Pacific Northwest National Lab, Richland Wa
2008–2008	Visiting Faculty	Univ. of Wa. Dept. of Atm. Sci, Seattle, WA
2004–2008	Chair	International Global Atmospheric Chemistry Project
2003–2010	Chair	Atmosphere Working Group, Community Climate System Modeling Project
2001–present.	Adjunct Faculty,	Univ. of Colorado, Boulder, CO
2009–present.	Affiliate Professor,	Univ. of Washington, Boulder, CO
2000–2008.	Senior Scientist,	Nat. Center for Atmos. Research, Boulder, CO
1991–2000.	Scientist III,	Nat. Center for Atmos. Research, Boulder, CO
Sep 1990–May 1991	Visiting Scientist	Eur Ctr for M-Range Wea Fcsts, Reading, England.
Apr 1990–Sep 1990	Visiting Scientist	Stockholm Univ., Stockholm, Sweden
1987–1991	Scientist II	Nat. Center for Atmos. Research, Boulder, CO
1984–1987	Scientist I	Nat. Center for Atmos. Research, Boulder, CO
1983–1984	Postdoctoral Fellow	Nat. Center for Atmos. Research, Boulder, CO
1981–1983	Graduate Research Fellow	Nat. Center for Atmos. Research, Boulder, CO

## Professional societies

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American Meteorological Society.  
American Geophysical Union.  
American Association for the Advancement of Science.

## Awards

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1981: NCAR Graduate Research Fellow  
1983: NCAR Post-Doctoral Fellow  
1993: American Meteorological Society, Editors Award, Monthly Weather Review.  
2006: NASA GSFC Laboratory for Atmospheres Distinguished Lecturer Series Award.  
2010: AAAS Fellow

### **Committees, panels, courses:**

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Tellus Editorial Advisory Board, 1991–present  
Member, NSF Science and Technology Center for Clouds, Chemistry and Climate (C<sup>4</sup>). 1990-2000  
Co-chair, Chemistry Modeling Group of C<sup>4</sup> 1990-2000.  
Steering Committee — International Global Atmospheric Chemistry group (IGAC) on Stratospheric and Upper Tropospheric Aerosols (SUTA) 1998-1998  
Numerous NASA Science Teams (1995-present)  
Steering Committee International Global Atmospheric Chemistry (IGAC) Program. 2003-present;  
VAMOS Ocean-Cloud-Atmosphere-Land Study (VOCALS) SSC 2006-2007  
Polar Study using Aircraft, Remote Sensing, Surface Measurements and Models, of Climate, Chemistry, Aerosols, and Transport (POLARCAT) SSC 2006-2007  
Community Climate System Model (CCSM) Program Scientific Steering Committee 2007-present  
Organizer: *Summer Colloquium on The Art of Climate Modeling*; 2006. Advanced Study Program of the National Center for Atmospheric Research  
Numerous Workshops for IGAC, and NCAR CCSM/AMWG activities over the last 5 years  
National Research Council review panel for CCSP Synthesis and Assessment Product 3.2., 2007  
Intergovernmental Panel on Climate Change WG1 (Lead author) and WG3 (Contributing Author), 2010-2013  
National Research Council panel on "Geoengineering Climate: Technical Analysis and Discussion of Impacts.", 2013-2014

### **Refereed Publications by year**

- [1] Rasch, P. J.; 1985: Developments in normal mode initialization. part I: A simple interpretation for normal mode initialization; *Mon. Weather Rev.*; **113**, 1746–1753.
- [2] Rasch, P. J.; 1985: Developments in normal mode initialization. part II: A new method and its comparison with currently used schemes; *Mon. Weather Rev.*; **113**, 1753–1770.
- [3] Rasch, P. J.; 1986: Toward atmospheres without tops: Absorbing upper boundary conditions for numerical models; *Q. J. R. Meteorol. Soc.*; **112**, 1195–1218.
- [4] Errico, R. M. and P. J. Rasch; 1988: A comparison of various normal-mode initialization schemes and the inclusion of diabatic processes; *Tellus*; **40A**, 1–25.
- [5] Donner, L. J. and P. J. Rasch; 1989: Cumulus initialization in a global model for numerical weather prediction; *Mon. Weather Rev.*; **117**, 2654–2671.
- [6] Williamson, D. L. and P. J. Rasch; 1989: Two-dimensional semi-Lagrangian transport with shape-preserving interpolation; *Mon. Weather Rev.*; **117**, 102–129.
- [7] Rasch, P. J. and D. L. Williamson; 1990: Computational aspects of moisture transport in global models of the atmosphere; *Q. J. R. Meteorol. Soc.*; **116**, 1071–1090.
- [8] Rasch, P. J. and D. L. Williamson; 1990: On shape-preserving interpolation and semi-Lagrangian transport.; *SIAM J. Scientific and Statistical Computations*; **11**, 4, 656–687.
- [9] Rasch, P. J. and D. L. Williamson; 1991: Sensitivity of a general circulation model climate to the moisture transport formulation; *J. Geophys. Res.*; **96**, 13,123–13,137.

- [10] Smolarkiewicz, P. K. and P. J. Rasch; 1991: Monotone advection on the sphere: An eulerian versus semi-lagrangian approach; *J. Atmos. Sci.*; **48**, 793–810.
- [11] Hess, P. G., D. S. Battisti, and P. J. Rasch; 1993: Maintenance of the intertropical convergence zones and the large-scale tropical circulation on a water-covered earth; *J. Atmos. Sci.*; **51**, 5, 691–713.
- [12] Hack, J. J., B. A. Boville, J. T. Kiehl, and P. J. Rasch; 1994: Climate statistics from the National Center for Atmospheric Research Community Climate Model CCM2; *J. Geophys. Res.*; **99**, 20785–20813.
- [13] Hartley, D. E., D. L. Williamson, P. J. Rasch, and R. Prinn; 1994: Examination of tracer transport in the NCAR CCM2 by comparison of CF<sub>Cl</sub><sub>3</sub> simulations with ALE/GAGE observations; *J. Geophys. Res.*; **99**, 12,855–12,896.
- [14] Rasch, P. J., X. X. Tie, B. A. Boville, and D. L. Williamson; 1994: A three-dimensional transport model for the middle atmosphere; *J. Geophys. Res.*; **99**, 999–1017.
- [15] Rasch, P. J.; 1994: Conservative shape preserving 2-dimensional transport on a spherical reduced grid; *Mon. Weather Rev.*; **122**, 6, 1337–1350.
- [16] Tie, X. X., G. P. Brasseur, P. Friedlingstein, C. Granier, and P. J. Rasch; 1994: The impact of high altitude aircraft on the ozone layer in the stratosphere; *Journal Atmospheric Chemistry*; **18**, 103–128.
- [17] Williamson, D. L. and P. J. Rasch; 1994: Water vapor transport in the NCAR CCM2; *Tellus*; **46A**, 34–51.
- [18] Hecht, M. W., W. R. Holland, and P. J. Rasch; 1995: Upwind-weighted advection schemes for ocean tracer transport: An evaluation in a passive tracer context; *J. Geophys. Res.*; **100**, C10, 20763–20778.
- [19] Mahowald, N. M., P. J. Rasch, and R. G. Prinn; 1995: Cumulus parameterizations in chemical transport models.; *J. Geophys. Res.*; **100**, 16173–26189.
- [20] Rasch, P. J., B. A. Boville, and G. P. Brasseur; 1995: A three-dimensional general circulation model with coupled chemistry for the middle atmosphere; *J. Geophys. Res.*; **100**, 9041–9071.
- [21] Erickson, D. J., P. J. Rasch, P. P. Tans, P. Friedlingstein, P. Ciais, E. Maier-Reimer, K. Six, C. A. Fischer, and S. Walters; 1996: The seasonal cycle of atmospheric CO<sub>2</sub>: A study based on the NCAR Community climate model (CCM2); *J. Geophys. Res.*; **101**, D10, 15079–15097.
- [22] Brasseur, G. P., X. X. Tie, P. J. Rasch, and F. Lefèvre; 1997.: A three-dimensional simulation of the antarctic ozone hole: Impact of anthropogenic chlorine on the lower stratosphere and upper troposphere; *J. Geophys. Res.*; **102**, 8909–8930.
- [23] Jacob, D. J., M. J. Prather, B. A. Boville, P. J. Rasch, J. Feichter, P. S. Kasibhatla, Verver, J. E. Penner, D. Bergmann, C. Genton, Y. J. Balkanski, P. Zimmermann, S. R. Beagley, W. T. Blackshear, D. A. Rotman, M. Chiba, M. Chipperfield, P. D. Brown, R.-L. Shia, K. Law, C. Reeves, and M. Brown; 1997: Intercomparison of convective and synoptic transport in global models using <sup>222</sup>Rn and other tracers; *J. Geophys. Res.*; **102**, 5953–5970.

- [24] Krishnamurti, T. N., B. Jha, P. J. Rasch, and V. Ramanathan; 1997: A high resolution global reanalysis highlighting the winter monsoon. part I, reanalysis fields; *Meteorol. Atmos. Physics.*; , 64, 123–150.
- [25] Krishnamurti, T. N., B. Jha, P. J. Rasch, and V. Ramanathan; 1997: A high resolution global reanalysis highlighting the winter monsoon. part II, transients and passive tracer transports; *Meteorol. Atmos. Physics.*; , 64, 151–171.
- [26] Mahowald, N. M., R. G. Prinn, and P. J. Rasch; 1997: Deducing  $CCl_3F$  emissions using an inverse method and chemical transport models with assimilated winds; *J. Geophys. Res.*; 102, D23, 28153–28168.
- [27] Mahowald, N. M., P. J. Rasch, B. E. Eaton, S. Whittleston, and R. G. Prinn; 1997: Transport of  $^{222}\text{Radon}$  to the remote troposphere using MATCH and assimilated winds from ECMWF and NCEP/NCAR; *J. Geophys. Res.*; 102 (D23), 28139–28151.
- [28] Rasch, P. J., N. M. Mahowald, and B. E. Eaton; 1997: Representations of transport, convection, and the hydrologic cycle in chemical transport models: Implications for the modeling of short-lived and soluble species; *J. Geophys. Res.*; 102, 28127–28138.
- [29] Waugh, D. W., T. M. Hall, W. J. Randel, P. J. Rasch, B. A. Boville, K. A. Boering, S. C. Wofsy, D. C. Daube, J. W. Elkins, D. W. Fahey, G. S. Dutton, C. M. Volk, and P. F. Vohralik; 1997: Three-dimensional simulations of long-lived tracers using winds from MACCM2; *J. Geophys. Res.*; 102, 21493–21513.
- [30] Brasseur, G. P., D. A. Hauglustaine, S. Walters, P. J. Rasch, J.-F. Müller, C. Granier, and X. X. Tie; 1998: MOZART, a global chemical transport model for ozone and related chemical tracers: 1, model description; *J. Geophys. Res.*; 103, 28265–28289.
- [31] Hauglustaine, D. A., G. P. Brasseur, S. Walters, P. J. Rasch, J. F. Müller, L. K. Emmons, and M. A. Carroll; 1998: MOZART: A global chemical transport model of ozone and related chemical tracers, part 2. model results and evaluation; *J. Geophys. Res.*; pp. 28291–28335.
- [32] Kiehl, J. T., J. J. Hack, G. B. Bonan, B. B. Boville, D. L. Williamson, and P. J. Rasch; 1998: The National Center for Atmospheric Research Community Climate Model: CCM3; *J. Climate*; 11, 1131–1149.
- [33] Rasch, P. J. and J. E. Kristjánsson; 1998: A comparison of the CCM3 model climate using diagnosed and predicted condensate parameterizations; *J. Climate*; 11, 1587–1614.
- [34] Zhang, G. J., J. T. Kiehl, and P. J. Rasch; 1998: Response of climate simulations to a new convective parameterization in the National Center for Atmospheric Research.; *J. Climate*; 11, 8, 2097–2115.
- [35] Barrie, L. A., Y. Yi, W. R. Leaitch, U. Lohmann, P. Kasibhatla, G. J. Roelofs, J. Wilson, F. McGovern, C. Benkovitz, M. A. Melieres, K. Law, J. Prospero, M. Kritz, D. Bergmann, C. Bridgeman, M. Chin, J. Christensen, R. Easter, J. Feichter, C. Land, A. Jeuken, E. Kjellstrom, D. Koch, and P. J. Rasch; 1999: A comparison of large scale atmospheric sulphate aerosol models (COSAM): overview and highlights; *Tellus*; 53, 615.
- [36] Barrie, L. A., Y. Yi, U. Lohmann, W. R. Leaitch, P. Kasibhatla, G.-J. Roelofs, J. Wilson, F. McGovern, C. Benkovitz, M. A. Meliere, K. Law, J. Prospero, M. Kritz, D. Bergmann, C. Bridgeman, M. Chin, J. Christensen, R. Easter, J. Feichter, A. Jeuken, E. Kjellstrom, D. Koch, C. Land, and P. J. Rasch; 1999: A comparison of large scale atmospheric sulphate aerosol models (COSAM): overview and highlights; *Tellus*; 53, 673.

- [37] Collins, W. D., P. J. Rasch, and B. E. Eaton; 1999: Forecasting aerosols using a CTM with assimilation of satellite aerosol retrievals 1. Methodology for INDOEX; *EOS*; 80, 17, S31–S32.
- [38] Douglass, A. R., M. P. Prather, T. Hall, S. E. Strahan, P. J. Rasch, L. Sparling, L. Coy, , and J. Rodriquez; 1999: Choosing meteorological input for the global modeling initiaitve assessment of high speed aircraft; *J. Geophys. Res.*; 104, 27545–27564.
- [39] Lawrence, M. J., P. J. Crutzen, P. J. Rasch, B. E. Eaton, , and N. M. Mahowald; 1999: A model for studies of tropospheric photochemistry: Description, global simulation characteristics, and evaluation; *J. Geophys. Res.*; 104, D21, 26245–26278.
- [40] Lawrence, M. G., P. J. Crutzen, and P. J. Rasch; 1999: Analysis of the CEPEX ozone data using a 3D chemistry-meteorology model; *Q. J. R. Meteorol. Soc.*; 125, 2987–3009.
- [41] Lohmann, U., W. R. Leaitch, K. Law, L. Barrie, Y. Yi, D. Bergmann, C. Bridgeman, M. Chin, J. Christensen, R. Easter, J. Feichter, A. Jeuken, E. Kjellstrom, D. Koch, C. Land, P. J. Rasch, and G.-J. Roelofs; 1999: vertical distributions of sulfur species simulated by large scale atmospheric models in COSAM:comparison with observations; *Tellus*; 53, 646–672.
- [42] Rasch, P. J., W. D. Collins, and B. E. Eaton; 1999: Forecasting aerosols using a CTM with assimilation of satellite aerosol retrievals 2. A 4D aerosol analysis for INDOEX; *EOS*; 80, 17, S32.
- [43] Barth, M., P. J. Rasch, J. T. Kiehl, C. M. Benkovitz, and S. E. Schwartz; 2000: Sulfur chemistry in the National Center for Atmospheric Reseach Community Climate Model: Description, evaluation, features and sensitivity to aqueous chemistry; *J. Geophys. Res.*; 105, D1, 1387–1415.
- [44] Clarke, A., W. C. Collins, P. J. Rasch, V. Kapustin, K. Moore, and S. Howell; 2000: Dust and pollution transport on global scales: Aerosol measurement and model predictions; *J. Geophys. Res.*; 106, D23, 32,555–32,569.
- [45] Kiehl, J. T., T. L. Schneider, P. J. Rasch, M. Barth, and J. Wong; 2000: Radiative forcing due to sulfate aerosols from simulations with the National Center for Atmospheric Research Community Climate Model, version 3; *J. Geophys. Res.*; 105, 1441–1457.
- [46] Rasch, P. J., J. Feichter, K. Law, N. Mahowald, J. Penner, C. Benkovitz, C. Genthon, C. Giannakopoulos, P. Kasibhatla, D. Koch, H. Levy, T. Maki, M. Prather, D. L. Roberts, G.-J. Roelofs, D. Stevenson, Z. Stockwell, S. Taguchi, M. Kritz, M. Chipperfield, D. Baldocchi, P. McMurry, L. Barrie, Y. Balkanski, R. Chatfield, E. Kjellstrom, M. Lawrence, H. N. Lee, J. Lelieveld, K. J. Noone, J. Seinfeld, G. Stenchikov, S. Schwartz, C. Walcek, and D. Williamson; 2000: A comparison of scavenging and deposition processes in global models; results from the WCRP Cambridge workshop of 1995; *Tellus*; 52B, 1025–1056.
- [47] Rasch, P. J., M. Barth, J. T. Kiehl, C. M. Benkovitz, and S. E. Schwartz; 2000: A description of the global sulfur cycle and its controlling processes in the National Center for Atmospheric Research Community Climate Model, version 3; *J. Geophys. Res.*; 105, 1367–1385.
- [48] Boville, B. A., J. T. Kiehl, P. J. Rasch, and F. O. Bryan; 2001: Improvements to the NCAR CSM-1 for transient climate simulation; *J. Climate*; 14, 164–179.

- [49] Collins, W. D., P. J. Rasch, B. E. Eaton, B. Khattatov, J.-F. Lamarque, and C. S. Zender; 2001: Simulating aerosols using a chemical transport model with assimilation of satellite aerosol retrievals: Methodology for INDOEX; *J. Geophys. Res.*; *106*, D7, 7313–7336.
- [50] Jöckel, P. R., R. von Kuhlmann, M. G. Lawrence, B. Steil, C. Brenninkmeijer, P. J. Crutzen, P. J. Rasch, and B. Eaton; 2001: On a fundamental problem in implementing flux-form advection schemes for tracer transport in 3-dimensional general circulation and chemistry transport models; *Q. J. R. Meteorol. Soc.*; *127*, 1035–1052.
- [51] Ramanathan, V., P. J. Crutzen, J. Lelieveld, D. Althausen, J. Anderson, M. O. Andreae, W. Cantrell, G. Cass, C. E. Chung, A. D. Clarke, W. D. Collins, J. A. Coakley, F. Dulac, J. Heintzenberg, A. J. Heymsfield, B. Holben, J. Hudson, A. Jayaraman, J. T. Kiehl, T. N. Krishnamurti, D. Lubin, A. P. Mitra, G. McFarquhar, T. Novakov, J. A. Ogren, I. A. Podgorny, K. Prather, J. M. Prospero, K. Priestley, P. K. Quinn, K. Rajeev, P. J. Rasch, S. Rupert, R. Sadourney, S. K. Satheesh, P. Sheridan, G. E. Shaw, , and F. P. J. Valero; 2001: The indian ocean experiment: An integrated assessment of the climate forcing and effects of the great indo-asian haze; *J. Geophys. Res.*; *106*, 28371–28398.
- [52] Rasch, P. J., W. D. Collins, and B. E. Eaton; 2001: Understanding the Indian Ocean Experiment INDOEX aerosol distributions with an aerosol assimilation.; *J. Geophys. Res.*; *106*, D7, 7337–7335.
- [53] Roelofs, G.-J., , P. Kasibhatla, L. Barrie, D. Bergmann, C. Bridgeman, M. Chin, J. Christensen, R. Easter, J. Feichter, A. Jeuken, E. Kjellström, D. Koch, C. Land, U. Lohmann, P. J. Rasch, and Y. Yi; 2001: Analysis of regional budgets of sulfur species modelled for the COSAM exercise; *Tellus*; *53*, 673.
- [54] Rotman, D., J. Tannahill, D. Kinnison, P. Connell, Bergmann, Proctor, J. Rodriguez, S.-J. Lin, R. B. Rood, M. Prather, P. Rasch, D. Considine, R. Ramaroson, and R. Kawa; 2001: Global Modeling Initiative Assessment Model: Model description, integration and testing of the transport shell; *J. Geophys. Res.*; *106*, 1669–1691.
- [55] Bergman, J. W. and P. J. Rasch; 2002: Parameterizing vertically-coherent cloud distributions; *Journal of the Atmospheric Sci.*; *410*; 255TSKL30.
- [56] Colarco, P. R., O. B. Toon, O. Torres, and P. J. Rasch; 2002: Determining the UV imaginary index of refraction of saharan dust particles from TOMS data and a three dimensional model of dust transport; *J. Geophys. Res.*; cant find the citation.
- [57] Collins, W. D., P. J. Rasch, B. E. Eaton, D. W. Fillmore, J. T. Kiehl, T. C. Beck, and C. S. Zender; 2003: Simulation of aerosol distributions and radiative forcing for INDOEX: Regional climate impacts; *J. Geophys. Res.*; *107*; doi 10.1029/2000JD000032.
- [58] Lawrence, M. G., P. J. Rasch, R. von Kuhlmann, J. Williams, H. Fischer, M. de Reus, J. Lelieveld, P. J. Crutzen, M. Schultz, P. Stier, H. Huntrieser, J. Heland, A. Stohl, C. Forster, H. Elbern, H. Jakobs, and R. R. Dickerson; 2003: Global chemical weather forecasts for field campaign planning: predictions and observations of large-scale features during MINOS, CONTRACE, and INDOEX; *Atmos. Chem. and Phys.*; pp. 267–289.
- [59] Lawrence, M. G., R. von Kuhlmann, M. Salzmann, and P. J. Rasch; 2003: The balance of effects of convective transport in deep cumulus clouds on tropospheric ozone; *Geophys. Res. Lett.*; *30*, 18; doi:10.1029/2003GL017644.

- [60] Steil, B., C. Brühl, E. Manzini, P. J. Crutzen, J. Lelieveld, P. J. Rasch, E. Roeckner, and K. Krüger; 2003: A new interactive chemistry-climate model: 1. present-day climatology and interannual variability of the middle atmosphere using the model and 9 years of HALOE/UARS data; *J. Geophys. Res.*; 108; doi:10.1029/2002JD002971.
- [61] von Kuhlmann, R., M. G. Lawrence, P. J. Crutzen, and P. J. Rasch; 2003: A model for studies of tropospheric ozone and non-methane hydrocarbons: Model description and ozone results; *J. Geophys. Res.*; , 108; doi:10.1029/2002JD002893.
- [62] von Kuhlmann, R., M. G. Lawrence, P. J. Crutzen, and P. J. Rasch; 2003: A model for studies of tropospheric ozone and non-methane hydrocarbons: Model evaluation of ozone related species; *J. Geophys. Res.*; , 108; 4729, doi:10.1029/2002JD003348.
- [63] Zhang, M. H., W. Lin, C. S. Bretherton, J. J. Hack, and P. J. Rasch; 2003: A modified formulation of fractional stratiform condensation rate in the NCAR Community Atmospheric Model (CAM2); *J. Geophys. Res.*; 108, D1; 4035, doi:10.1029/2002JD002523.
- [64] Hines, K. M., D. H. Bromwich, P. J. Rasch, and M. J. Iacono; 2004: Antarctic clouds and radiation within the NCAR climate models; *J. Climate*; 17, 1198–1212.
- [65] Lawrence, M. J. and P. J. Rasch; 2005: Tracer transport in deep convective updrafts: plume ensemble versus bulk formulations; *J. Atmos. Sci.*; 62, 2880–2894.
- [66] Hack, J. J., J. M. Caron, S. G. Yeager, K. W. Oleson, M. M. Holland, J. E. Truesdale, and P. J. Rasch; 2006: The simulation of the global hydrological cycle in the CCSM community atmosphere model CAM3: Mean state; *J. Climate*; 19, 11, 2199–2221.
- [67] Rasch, P. J., D. B. Coleman, N. Mahowald, D. L. Williamson, S. J. Lin, B. A. Boville, and P. Hess; 2006: Characteristics of atmospheric transport using three numerical formulations for atmospheric dynamics in a single GCM framework; *J. Climate*; 19, 2243–2266.
- [68] Rasch, P. J., D. B. Coleman, N. Mahowald, D. L. Williamson, S.-J. Lin, B. A. Boville, and P. Hess; 2006: Characteristics of transport using three formulations of atmospheric dynamics in a single GCM framework; *J. Climate*; 19, 2243–2266.
- [69] Boville, B. A., P. J. Rasch, J. J. Hack, and J. R. McCaa; 2006: Representation of clouds and precipitation processes in the Community Atmosphere Model 3 (CAM3); *J. Climate*; pp. 2184–2198.
- [70] Collins, W. D., P. J. Rasch, B. A. Boville, *et al.*; 2006: The formulation and atmospheric simulation of the Community Atmosphere Model: CAM3; *J. Climate*; 19, 2144–2161.
- [71] Lin, J.-L., G. N. Kiladis, B. E. Mapes, K. M. Weickmann, K. R. Sperber, W. Lin, M. Wheeler, S. D. Schubert, A. D. Genio, L. J. Donner, S. Emori, J.-F. Gueremy, F. Hourdin, P. J. Rasch, E. Roeckner, and J. F. Scinocca; 2006: Tropical intraseasonal variability in 14 IPCC AR4 climate models part I: Convective signals; *J. Climate*; 19, 2665–2690; doi:10.1175/JCLI3735.1.
- [72] Mahowald, N. M., D. R. Muhs, S. Levis, P. J. Rasch, M. Yoshioka, C. S. Zender, and C. Luo; 2006: Change in atmospheric mineral aerosols in response to climate: Last glacial period, preindustrial, modern, and doubled carbon dioxide climates; *J. Geophys. Res.*; 111; d10202, doi:10.1029/2005JD006653.
- [73] Rasch, P. J., M. J. Stevens, L. Ricciardulli, A. Dai, R. Wood, B. A. Boville, B. Eaton, and J. J. Hack; 2006: A characterization of tropical transient activity in the CAM3 atmospheric hydrologic cycle; *J. Climate*; 19, 2222–2242.

- [74] Bala, G., B. Rood, A. Mirin, J. McClean, K. Achutarao, D. Bader, P. Gleckler, R. Neale, and P. J. Rasch; 2007: Evaluation of a CCSM3 simulation with a finite volume dynamical core for the atmosphere at  $1^{\circ}$  latitude x  $1.25^{\circ}$  longitude resolution; *J. Climate*; 21, 1467–1486.
- [75] Doney, S. C., N. Mahowald, I. Lima, R. A. Feely, F. T. Mackenzie, J.-F. Lamarque, and P. J. Rasch; 2007: Impact of anthropogenic atmospheric nitrogen and sulfur deposition on ocean acidification and the inorganic carbon system; *Proc. Nat. Acad. Sci.*; 104, 37, 14680–14585; doi:10.1073/pnas.0702218104.
- [76] Flanner, M. G., C. S. Zender, J. T. Randerson, and P. J. Rasch; 2007: Present-day climate forcing and response from black carbon in snow; *J. Geophys. Res.*; 112, D112102; doi:10.1029/2006JD008003.
- [77] Latham, J., P. J. Rasch, C.-C. Chen, L. Kettles, A. Gadian, A. Gettelman, H. Morrison, K. Bower, and T. Choularton; 2008: Global temperature stabilization via controlled albedo enhancement of low-level maritime clouds; *Phil. Trans. R. Soc. Lond.*; 366, 1882, 3969–3987; dOI 10.1098/rsta2008.0137.
- [78] Mitchell, D. L., P. J. Rasch, D. Ivanova, G. McFarquhar, and T. Nousiainen; 2008: The impact of controversial small ice crystals on GCM simulations; *Geophys. Res. Lett.*; 108806, doi:10.1029/2008GL033552.
- [79] Pfister, G. G., P. G. Hess, L. K. Emmons, P. J. Rasch, and F. M. Vitt; 2008: Impact of the summer 2004 alaska fires on TOA clear-sky radiation fluxes; *J. Geophys. Res.*; , D02204; doi:10.1029/2007JD008797.
- [80] Rasch, P. J., P. J. Crutzen, and D. B. Coleman; 2008: Exploring the geoengineering of climate using stratospheric sulfate aerosols: The role of particle size; *Geophys. Res. Lett.*; 35; 102809, doi:10.1029/2007GL032179.
- [81] Rasch, P. J., S. Tilmes, R. Turco, A. Robock, L. Oman, C. C. Chen, and G. Stenchikov; 2008: A review of stratospheric sulfate aerosols for geoengineering; *Phil. Trans. R. Soc. Lond.*; 366, 1882, 4007–4037; dOI 10.1098/rsta2008.0131.
- [82] Richter, J. R. and P. J. Rasch; 2008: Effects of convective momentum transport on the atmospheric circulation in the Community Atmosphere Model, version 3 (CAM3); *J. Climate*; 21.
- [83] Flanner, M. G., C. S. Zender, P. G. Hess, N. M. Mahowald, T. H. Painter, V. Ramanathan, and P. J. Rasch.; 2009: Springtime warming and reduced snow cover from carbonaceous particles; *Atmos. Chem. and Phys.*; 9, 7, 2481–2497; ISSN 1680-7316; URL <http://www.atmos-chem-phys.net/9/2481/2009/>.
- [84] Quaas, J., Y. Ming, S. Menon, T. Takemura, M. Wang, J. E. Penner, A. Gettelman, U. Lohmann, N. Bellouin, O. Boucher, A. M. Sayer, G. E. Thomas, A. McComiskey, G. Feingold, C. Hoose, J. E. Kristjánsson, X. Liu, Y. Balkanski, L. J. Donner, P. A. Ginoux, P. Stier, B. Grandey, J. Feichter, I. Sednev, S. E. Bauer, D. Koch, R. G. Grainger, A. Kirkeveg, T. Iversen, Ø. Seland, R. Easter, S. J. Ghan, P. J. Rasch, H. Morrison, J.-F. Lamarque, M. J. Iacono, S. Kinne, and M. Schulz; 2009: Aerosol indirect effects – general circulation model intercomparison and evaluation with satellite data; *Atmos. Chem. and Phys.*; 9, 22, 8697–8717; doi:10.5194/acp-9-8697-2009; URL <http://www.atmos-chem-phys.net/9/8697/2009/>.

- [85] Doherty, S. J., P. J. Rasch, and A. Ravishankara; 2009: Initiative to improve process representation in chemistry-climate models; *EOS*; **90**, 24, 206–207; doi:10.1029/2009EO240002.
- [86] Kim, D., C. Wang, A. M. L. Ekman, M. C. Barth, and P. J. Rasch; 2009: Distribution and direct radiative forcing of carbonaceous and sulfate aerosols in an interactive size-resolving aerosol-climate model; *J. Climate*; dOI 2007JD009756.
- [87] Rasch, P. J., C.-C. Chen, and J. L. Latham; 2009: Geo-engineering by cloud seeding: influence on sea-ice and the climate system; *Env. Res. Lett.*; **4**, 8pp; 045112.
- [88] Zhang, T., D.-Z. Sun, R. Neale, and P. J. Rasch; 2009: An evaluation of ENSO asymmetry in the community climate system MOdels: A view from the subsurface; *J. Climate*; dOI: 10.1175/2009JCLI2933.1.
- [89] Tilmes, S., R. R. Garcia, E. D. Kinnison, A. Gettelman, and P. J. Rasch; 2009: Impact of geo-engineered aerosols on troposphere and stratosphere; *J. Geophys. Res.*; d12305, doi:10.1029/2008JD011420.
- [90] Wang, C., D. C. Kim, A. Ekman, M. C. Barth, and P. J. Rasch; 2009: Impact of absorbing aerosols on the Indian summer monsoon; *Geophys. Res. Lett.*; **36**; l21704, doi:10.1029/2009GL040114.
- [91] Tosca, M. G., J. T. Randerson, C. S. Zender, M. G. Flanner, and P. J. Rasch; 2010: Do biomass burning aerosol intensify drought in equatorial Asia during El Niño?; *Atmos. Chem. and Phys.*; **10**, 3515–3528; URL [www.atmos-chem-phys.net/10/3515/2010/](http://www.atmos-chem-phys.net/10/3515/2010/).
- [92] Rasch, P. J.; 2010: Technical fixes and climate change: optimizing for risks and consequences; *Env. Res. Lett.*; **5**, 2pp; doi:10.1088/1748-9326/5/3/031001.
- [93] Fan, J., S. J. Ghan, M. Ovchinnikov, X. Liu, P. Rasch, and A. Korolev; 2011: Representation of arctic mixed-phase clouds and the wegener-bergeron-findeisen process in climate models: Perspectives from a cloud-resolving study.; *J. Geophys. Res.*; **116**, D00T07; doi: doi:10.1029/2010JD015375.
- [94] Chen, C. C. and P. J. Rasch; 2011: Climate simulations with an isentropic finite-volume dynamical core; *J. Climate*; **25**, 28432861; doi:dx.doi.org/10.1175/2011JCLI4184.1.
- [95] Fan, J., S. J. Ghan, M. Ovchinnikov, X. Liu, P. Rasch, and A. Korolev; 2011: "representation of arctic mixed-phase clouds and the wegener-bergeron-findeisen process in climate models: Perspectives from a cloud-resolving study."; *J. Geophys. Res.*; **116**, D00T07; doi: 10.1029/2010JD015375.
- [96] Gent, P. R., L. J. Donner, M. M. Holland, E. C. Hunke, S. R. Jayne, D. M. Lawrence, R. B. Neale, P. J. Rasch, M. Vertenstein, P. H. Worley, Z.-L. Yang, and M. Zhang; 2011: The Community Climate System Model Version 4; *J. Climate*; pp. 4973–4991; doi: 10.1175/2011JCLI4083.1.
- [97] Sakaeda, N., R. Wood, and P. J. Rasch; 2011: Direct and semidirect aerosol effects of southern african biomass burning aerosol; *J. Geophys. Res.*; doi:10.1029/2010D015540.
- [98] Teixeira, J., S. Cardoso, M. Bonazzola, J. N. Cole, A. D. DelGenio, C. DeMott, A. Franklin, C. Hannay, C. Jakob, Y. Jiao, J. Karlsson, H. Kitagawa, M. Koehler, A. Kuwano-Yoshida, C. LeDrian, A. Lock, M. Miller, P. Marquet, J. Martins, C. R. Mechoso, E. V. Meijgaard, I. Meinke, P. Miranda, D. Mironov, R. Neggers, H. L. Pan, D. A. Randall, P. J. Rasch,

- B. Rockel, W. B. Rossow, B. Ritter, A. P. Siebesma, P. Soares, F. J. Turk, P. Vaillancourt, A. V. Engeln, , and M. Zhao; 2011: Tropical and sub-tropical cloud transitions in weather and climate prediction models: the GCSS/WGNE Pacific Cross-section Intercomparison (GPCI); *J. Climate*; doi:10.1175/2011JCL13672.1.
- [99] Wang, H., P. J. Rasch, and G. Feingold; 2011: Manipulating marine stratocumulus cloud amount and albedo: a process-modeling study of aerosol-cloud-precipitation interactions in response to controlled seawater spray; *Atmos. Chem. and Phys.*; doi:10.5194/acp-11-4237-2011.
- [100] Liu, X., R. C. Easter, S. J. Ghan, R. Zaveri, P. J. Rasch, X. Shi, J.-F. Lamarque, A. Gettelman, H. Morrison, F. Vitt, A. Conley, S. Park, R. Neale, C. Hannay, A. Ekman, P. Hess, , N. Mahowald, W. Collins, M. Iacono, C. Bretherton, M. Flanner, and D. Mitchell; 2012: Toward a minimal representation of aerosol direct and indirect effects: Model description and evaluation; *Geosci. Model Devel.*; doi:10.5194/gmd-5-709-2012.
- [101] Rosenfeld, D., H. Wang, and P. J. Rasch; 2012: The roles of cloud drop effective radius and LWP in determining rain properties in marine stratocumulus; *Geophys. Res. Lett.*; doi: 2012GL052028.
- [102] Russell, L. M., P. J. Rasch, G. Mace, R. B. Jackson, J. Shepherd, P. Liss, M. Leinen, D. Schimel, N. E. Vaughan, A. C. Janetos, P. W. Boyd, R. J. Norby, K. Caldeira, J. Merikanto, P. Artaxo, J. Melillo, , and M. G. Morgan; 2012: Ecosystem impacts of geoengineering: a review for developing a science plan; *Ambio*; doi:10.1007/s13280-012-0258-5.
- [103] Smith, S. J. and P. J. Rasch; 2012: The long-term policy context for solar radiation management; *Climatic Change*; pp. 1–11; ISSN 0165-0009, 1573-1480; doi:10.1007/s10584-012-0577-3; URL <http://link.springer.com/article/10.1007/s10584-012-0577-3>.
- [104] Ma, P.-L., P. Rasch, H. Wang, K. Zhang, R. C. Easter, S. Tilmes, J. D. Fast, X. Liu, J.-H. Yoon, and J.-F. Lamarque; 2012: Uncertainties in black carbon transport into the arctic in CAM5 associated with the simulated meteorology; *J. Geophys. Res.*; in press.
- [105] Chand, D., R. Wood, S. Ghan, M. Wang, M. Ovchinnikov, P. J. Rasch, S. Miller, B. Schichtel, and T. Moore; 2012: Aerosol optical depth enhancement in partly cloudy conditions; *J. Geophys. Res. Atm.*; 117, D17207; doi:10.1029/2012JD017894.
- [106] Ganguly, D., P. J. Rasch, and J.-H. Yoon; 2012: Fast and slow responses of the south asian monsoon system to anthropogenic aerosols; *Geophys. Res. Lett.*; doi: 10.1029/2012GL053043.
- [107] Ghan, S., X. Liu, R. Easter, P. J. Rasch, J. Yoon, and B. Eaton; 2012: Toward a minimal representation of aerosols in climate models: Comparative decomposition of aerosol direct, semi-direct and indirect radiative forcing.; *J. Climate*; doi:10.1175/JCLI-D-11-00650.1.
- [108] Lamarque, J.-F., L. K. Emmons, P. G. Hess, D. E. Kinnison, S. Tilmes, F. Vitt, C. L. Heald, E. A. Holland, P. H. Lauritzen, J. Neu, J. J. Orlando, P. J. Rasch, and G. Tyndall; 2012: CAM-chem: description and evaluation of interactive atmospheric chemistry in the community earth system model; *Geosci. Model Devel.*; pp. 369–411; doi:10.5194/gmd-5-369-2012.
- [109] Latham, J., K. Bower, T. Choularton, H. Coe, P. Connelly, G. Cooper, T. Craft, J. Foster, A. Gadian, L. G. H. Iacovides, D. Johnston, B. Launder, B. Leslie, J. Meyer, A. Neukermans,

- B. Ormond, B. Parkes, P. J. Rasch, J. Rush, S. Salter, T. Stevenson, H. Wang, Q. Wang, and R. Wood; 2012: Marine Cloud Brightening; *Phil. Trans. R. Soc. Lond.*; 370, 4217–4262; doi:10.1098/rsta.2012.0086.
- [110] Gustafson, W. I., P.-L. Ma, H. Xiao, B. Singh, P. J. Rasch, and J. D. Fast; 2013: The separate physics and dynamics experiment (SPADE) framework for determining resolution awareness: A case study of microphysics: THE SPADE FRAMEWORK; *J. Geophys. Res.*; pp. n/a–n/a; ISSN 2169897X; doi:10.1002/jgrd.50711; URL <http://doi.wiley.com/10.1002/jgrd.50711>.
- [111] Hurrell, J. W., M. Holland, P. R. Gent, S. Ghan, J. E. Kay, P. J. Kushner, J.-F. Lamarque, W. Large, D. Lawrence, K. Lindsay, W. H. Lipscomb, M. C. Long, N. Mahowald, D. R. Marsh, R. B. Neale, P. J. Rasch, S. Vavrus, M. Vertenstein, D. Bader, W. Collins, J. Hack, J. Kiehl, and S. Marshall; 2013: The community earth system model: A framework for collaborative research; *Bulletin of the American Meteorological Society*; p. 130715075145003; ISSN 0003-0007, 1520-0477; doi:10.1175/BAMS-D-12-00121.1; URL <http://journals.ametsoc.org/doi/abs/10.1175/BAMS-D-12-00121.1>.
- [112] Tilmes, S., J. Fasullo, J.-F. Lamarque, D. R. Marsh, M. Mills, K. Alterskjaer, H. Muri, J. E. Kristjansson, O. Boucher, M. Schulz, J. N. S. Cole, C. L. Curry, A. Jones, J. Haywood, P. J. Irvine, D. Ji, J. C. Moore, D. B. Karam, B. Kravitz, P. J. Rasch, B. Singh, J.-H. Yoon, U. Niemeier, H. Schmidt, A. Robock, S. Yang, and S. Watanabe; 2013: The hydrological impact of geoengineering in the geoengineering model intercomparison project (GeoMIP): THE HYDROLOGIC IMPACT OF GEOENGINEERING; *J. Geophys. Res.*; 118, 19, 11,036–11,058; ISSN 2169897X; doi:10.1002/jgrd.50868; URL <http://doi.wiley.com/10.1002/jgrd.50868>.
- [113] Wan, H., P. J. Rasch, K. Zhang, J. Kazil, and L. R. Leung; 2013: Numerical issues associated with compensating and competing processes in climate models: an example from ECHAM-HAM; *Geosci. Model Dev.*; 6, 3, 861–874; ISSN 1991-9603; doi:10.5194/gmd-6-861-2013; URL <http://www.geosci-model-dev.net/6/861/2013/>.
- [114] Wang, H., R. C. Easter, P. J. Rasch, M. Wang, X. Liu, S. J. Ghan, Y. Qian, J.-H. Yoon, P.-L. Ma, and V. Vinoj; 2013: Sensitivity of remote aerosol distributions to representation of claudaerosol interactions in a global climate model; *Geoscientific Model Development*; 6, 3, 765–782; ISSN 1991-9603; doi:10.5194/gmd-6-765-2013; URL <http://www.geosci-model-dev.net/6/765/2013/>.
- [115] Yang, B., H. Wang, M. Wang, X. Liu, Y. Qian, G. Lin, L. R. Leung, P. J. Rasch, G. J. Zhang, S. A. McFarlane, C. Zhao, and Y. Zhang; 2013: Uncertainty quantification and parameter tuning in the CAM5 Zhang-McFarlane convection scheme and impact of improved convection on the global circulation and climate; *J. Geophys. Res.*; ISSN 0148-0227; doi:10.1029/2012JD018213; URL <http://www.agu.org/pubs/crossref/pip/2012JD018213.shtml>.
- [116] Zhang, M., C. S. Bretherton, P. N. Blossey, P. H. Austin, J. T. Bacmeister, S. Bony, F. Brient, S. K. Cheedela, A. Cheng, A. D. Del Genio, S. R. De Roode, S. Endo, C. N. Franklin, J.-C. Golaz, C. Hannay, T. Heus, F. A. Isotta, J.-L. Dufresne, I.-S. Kang, H. Kawai, M. Khler, V. E. Larson, Y. Liu, A. P. Lock, U. Lohmann, M. F. Khairoutdinov, A. M. Molod, R. A. J. Neggers, P. Rasch, I. Sandu, R. Senkbeil, A. P. Siebesma, C. Siegenthaler-Le Drian, B. Stevens, M. J. Suarez, K.-M. Xu, K. von Salzen, M. J. Webb, A. Wolf, and M. Zhao; 2013: CGILS: results from the first phase of an international project to understand the physical mechanisms of low

cloud feedbacks in single column models: CGILS results on low cloud feedback; *J. of Adv. in Modeling Earth Systems*; 5, 4, 826–842; ISSN 19422466; doi:10.1002/2013MS000246; URL <http://doi.wiley.com/10.1002/2013MS000246>; 00000.

- [117] Kravitz, B., K. Caldeira, O. Boucher, A. Robock, P. J. Rasch, K. Alterskjaer, D. B. Karam, J. N. S. Cole, C. L. Curry, J. M. Haywood, P. J. Irvine, D. Ji, A. Jones, J. E. Kristjansson, D. J. Lunt, J. C. Moore, U. Niemeier, H. Schmidt, M. Schulz, B. Singh, S. Tilmes, S. Watanabe, S. Yang, and J.-H. Yoon; 2013: Climate model response from the geoengineering model intercomparison project (GeoMIP); *J. Geophys. Res.*; 118, 15, 83208332; ISSN 2169-8996; doi:10.1002/jgrd.50646; URL <http://onlinelibrary.wiley.com/doi/10.1002/jgrd.50646/abstract>.
- [118] Kravitz, B., P. J. Rasch, P. M. Forster, T. Andrews, J. N. S. Cole, P. J. Irvine, D. Ji, J. E. Kristjansson, J. C. Moore, H. Muri, U. Niemeier, A. Robock, B. Singh, S. Tilmes, S. Watanabe, and J.-H. Yoon; 2013: An energetic perspective on hydrological cycle changes in the geoengineering model intercomparison project; *J. Geophys. Res.*; 118, 23, 2013JD020502; ISSN 2169-8996; doi:10.1002/2013JD020502; URL <http://onlinelibrary.wiley.com/doi/10.1002/2013JD020502/abstract>.
- [119] Kravitz, B., P. M. Forster, A. Jones, A. Robock, K. Alterskjær, O. Boucher, A. K. L. Jenkins, H. Korhonen, J. E. Kristjansson, H. Muri, U. Niemeier, A.-I. Partanen, P. J. Rasch, H. Wang, and S. Watanabe; 2013: Sea spray geoengineering experiments in the geoengineering model intercomparison project (GeoMIP): experimental design and preliminary results; *J. Geophys. Res.*; 118, 19, 11,17511,186; ISSN 2169-8996; doi:10.1002/jgrd.50856; URL <http://onlinelibrary.wiley.com/doi/10.1002/jgrd.50856/abstract>.
- [120] Ma, P.-L., J. R. Gattiker, X. Liu, and P. J. Rasch; 2013: A novel approach for determining source–receptor relationships in model simulations: a case study of black carbon transport in northern hemisphere winter; *Environmental Research Letters*; 8, 2, 024042; ISSN 1748-9326; doi:10.1088/1748-9326/8/2/024042; URL <http://iopscience.iop.org/1748-9326/8/2/024042>.
- [121] Ma, P., P. J. Rasch, H. Wang, K. Zhang, R. C. Easter, S. Tilmes, J. D. Fast, X. Liu, J.-H. Yoon, and J.-F. Lamarque; 2013: The role of circulation features on black carbon transport into the arctic in the community atmosphere model version 5 (CAM5); *J. Geophys. Res.*; 118, 10, 46574669; ISSN 2169-8996; doi:10.1002/jgrd.50411; URL <http://onlinelibrary.wiley.com/doi/10.1002/jgrd.50411/abstract>.
- [122] Myhre, G., B. H. Samset, M. Schulz, Y. Balkanski, S. Bauer, T. K. Berntsen, H. Bian, N. Belouin, M. Chin, T. Diehl, R. C. Easter, J. Feichter, S. J. Ghan, D. Hauglustaine, T. Iversen, S. Kinne, A. Kirkev $\ddot{g}$ , J.-F. Lamarque, G. Lin, X. Liu, M. T. Lund, G. Luo, X. Ma, T. van Noije, J. E. Penner, P. J. Rasch, A. Ruiz, . Seland, R. B. Skeie, P. Stier, T. Takemura, K. Tsigaridis, P. Wang, Z. Wang, L. Xu, H. Yu, F. Yu, J.-H. Yoon, K. Zhang, H. Zhang, and C. Zhou; 2013: Radiative forcing of the direct aerosol effect from AeroCom phase II simulations; *Atmos. Chem. and Phys.*; 13, 4, 1853–1877; ISSN 1680-7324; doi:10.5194/acp-13-1853-2013; URL <http://www.atmos-chem-phys.net/13/1853/2013/>.
- [123] Neale, R. B., J. Richter, S. Park, P. H. Lauritzen, S. J. Vavrus, P. J. Rasch, and M. Zhang; 2013: The mean climate of the community atmosphere model (CAM4) in forced SST and fully coupled experiments; *J. Climate*; , 2013; URL <http://journals.ametsoc.org/doi/abs/10.1175/JCLI-D-12-00236.1>.

- [124] Vinoj, V., P. J. Rasch, H. Wang, J.-H. Yoon, and P.-L. Ma; 2014: A dusty west asian link to Indian summer monsoon rainfall; *Nature Geosciences*; doi:10.1038/NGEO2107.

## In-preparation or submitted Articles

- [1] Yoon, J.-H., P. J. Rasch, H. Wang, V. Vinoj, and D. Ganguly; 2012: The role of carbonaceous aerosols on short-term variations on precipitation over north africa; *Geophys. Res. Lett.*; submitted.
- [2] Yoon, J.-H., P. J. Rasch, K. Balaguru, C. Hannay, and B. Singh; 2012: The role of the oceanic heat transport on arctic sea ice change in the 20th century; *Geophys. Res. Lett.*; submitted.
- [3] Yoon, J.-H., P. J. Rasch, S. M. Hagos, B. Singh, V. Vinoj, S.-Y.-S. Wang, and N. Zeng; 2012: Sahel drought and recovery in the 20th century: Aerosols as a pace maker; *Nature, Climatic Change*; submitted.
- [4] Park, S., C. S. Bretherton, and P. J. Rasch; 2013: Global cloud simulation in the Community Atmosphere Model version 5; *J. Climate*; submitted.

## Technotes, Book Chapters, etc

- [1] Williamson, D. L., P. J. Rasch, and D. E. Hartley; 1990: The WCRP CFCL<sub>3</sub> experiment.; Technical Report 24; WMO; Bermuda.
- [2] Hack, J. J., B. A. Boville, B. P. Briegleb, J. T. Kiehl, P. J. Rasch, and D. L. Williamson; 1993: Description of the NCAR Community Climate Model (CCM2); Technical Report NCAR/TN-382+STR; National Center for Atmospheric Research; 120 pp.
- [3] Rasch, P. J., H. Feichter, K. Law, and J. Penner; 1995: Modeling of Trace Constituents by Global Models; Technical report; World Meteorological Organization.
- [4] Ramanathan, V., P. J. Crutzen, J. A. Coakley, A. Clarke, W. D. Collins, R. Dickerson, D. Fahey, B. Gandrud, A. Heymsfield, J. T. Kiehl, J. Kuettner, T. Krishnamurti, D. Lubin, H. Maring, J. Ogren, J. Prospero, P. J. Rasch, D. Savoie, G. Shaw, A. Tuck, F. P. J. Valero, E. L. Woodbridge, and G. Zhang; 1996: Indian Ocean Experiment (INDOEX), A Multi-Agency Proposal for a Field Experiment in the Indian Ocean; Technical report; Center for Clouds, Chemistry, and Climate (C4), Scripps Institution of Oceanography; uRL = <http://borneo.ucsd.edu/publications/proposal>.
- [5] Krishnamurti, T. N., B. Jha, P. J. Rasch, and V. Ramanathan; 1997: A high resolution global reanalysis highlighting the winter monsoon; C4 Publication 181; Scripps Inst. Oceanography; La Jolla, CA, USA.
- [6] Rasch, P. J., J. Feichter, K. Law, N. Mahowald, J. Penner, C. Benkovitz, C. Genton, C. Giannakopoulos, P. Kasibhatla, D. Koch, H. Levy, T. Maki, M. Prather, D. L. Roberts, G.-J. Roelofs, D. Stevenson, Z. Stockwell, S. Taguchi, M. Kritz, M. Chipperfield, D. Baldocchi, P. McMurry, L. Barrie, T. Balkanski, R. Chatfield, E. Kjellstrom, M. Lawrence, H. N. Lee, J. Lelieveld, K. J. Noone, J. Seinfeld, G. Stenchikov, S. Schwarz, C. Walcek, and D. Williamson; 1999: Proceedings of a WCRP workshop on modelling the transport and scavenging of trace constituents by clouds in global atmospheric models; Technical Report 29, WMO / TD-No. 950; World Meteorological Organization; Geneva, Switzerland.

- [7] Collins, W. D., P. J. Rasch, B. A. Boville, J. J. Hack, J. R. McCaa, D. L. Williamson, J. T. Kiehl, B. P. Briegleb, C. M. Bitz, S.-J. Lin, M. H. Zhang, and Y. Dai; 2004: Description of the NCAR Community Atmosphere Model: CAM3.0; Technical Report NCAR/TN-464+STR; National Center for Atmospheric Research; Boulder, Colorado, USA; 226 pp., URL = <http://www.ccsm.ucar.edu/models/atm-cam>.
- [8] Neale, R. B., J. H. Richter, A. J. Conley, S. Park, P. H. Lauritzen, A. Gettelman, D. L. Williamson, P. J. Rasch, S. Vavrus, M. A. Taylor, W. D. Collins, M. Zhang, and S.-J. Lin; 2010: Description of the NCAR Community Atmosphere Model: CAM4.0; Technical Report NCAR/TN-485+STR; National Center for Atmospheric Research; Boulder, Colorado, USA; 195 pp., URL = <http://www.ccsm.ucar.edu/models/atm-cam>.
- [9] Neale, R. B., C. C. Chen, A. Gettelman, P. H. Lauritzen, S. Park, D. L. Williamson, A. J. Conley, R. Garcia, D. Kinnison, J.-F. Lamarque, D. Marsh, M. Mills, A. K. Smith, S. Tilmes, F. Vitt, H. Morrison, P. Cameron-Smith, W. D. Collins, M. J. Iacono, R. C. Easter, S. J. G. ans X. Liu, P. J. Rasch, and M. Taylor; 2012: Description of the NCAR Community Atmosphere Model: CAM5.0; Technical Report NCAR/TN-486+STR; National Center for Atmospheric Research; Boulder, Colorado, USA; 268 pp., URL = <http://www.ccsm.ucar.edu/models/atm-cam>.
- [10] Rasch, P. J., S. Tilmes, R. Turco, A. Robock, L. Oman, C. C. Chen, and G. Stenchikov; 2009: A review of stratospheric sulfate aerosols for geoengineering; in: B. Launder and M. Thompson (Editors) *Geo-Engineering Climate Change: Environmental Necessity or Pandora's Box?*; Cambridge University Press, Cambridge, U.K.
- [11] Latham, J., P. J. Rasch, C.-C. Chen, L. Kettles, A. Gadian, A. Gettelman, H. Morrison, K. Bower, and T. Choularton; 2009: Global temperature stabilization via controlled albedo enhancement of low-level maritime clouds; in: B. Launder and M. Thompson (Editors) *Geo-Engineering Climate Change: Environmental Necessity or Pandora's Box?*; Cambridge University Press, Cambridge, U.K.
- [12] Rasch, P. J.; 2012: Climate change modeling methodology, Introduction; in: P. J. Rasch (Editor) *Climate Change Modeling Methodology*; Springer New York; pp. 1–4; ISBN 978-1-4614-5766-4.
- [13] Rasch, P.; 2012: Atmospheric general circulation modeling; in: P. J. Rasch (Editor) *Climate Change Modeling Methodology*; Springer New York; pp. 115–137; ISBN 978-1-4614-5766-4.
- [14] Wuebbles, D. J., P. J. Rasch, D. Jacob, , D. H. Rind, J. Logan, J.-F. Müller, J. M. Rodriguez, C. J. Walcek, and Y. Wang; 1997: Chapter 4: Modeling the global effects of aircraft emissions; in: R. R. Friedl (Editor) *The Atmospheric Effects of Subsonic Aircraft: Interim Assessment Report of the Advanced Subsonic Technology Program*; NASA, Wahington, D.C.; Reference Publication 1400; p. 168.
- [15] Rasch, P. J. and M. G. Lawrence; 1998: Recent developments in transport methods at NCAR; in: B. Machenhauer (Editor) *MPI workshop on conservative transport methods*; Max Planck Institute for Meteorology, Hamburg, Germany; Report No. 265.; p. 93.